

Exploration Medical Capability (ExMC) Element

January 2017

Storyboard for the Medical System Concept of Operations for Mars Exploration Missions

Storyboard for the Medical System Concept of Operations for Transit to Mars



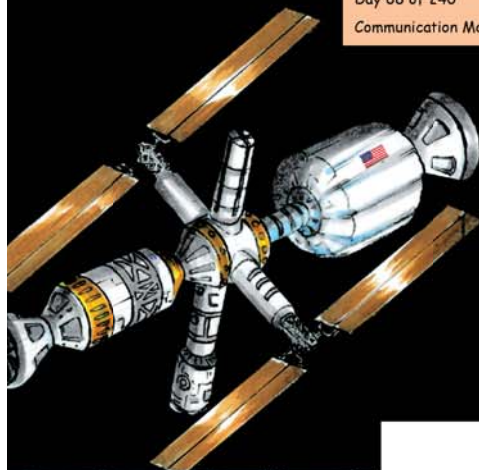
This storyboard conceptualizes one scenario of an integrated medical system during a Mars exploration mission. All content is for illustrative purposes only and neither defines nor implies system design requirement.

Illustration by Jesus Garate

Narrative by Eric Antonsen, MD, PhD

Mars Medical System ConOps Team: Melinda Hailey; David Reyes, MD; David Rubin; Michelle Urbina

Mission Phase: Transit to Mars
Number of Crew: 4
Day 68 of 240
Communication Mode: Autonomous



Ok, before I get started on the crew health status review for this week, let me check the cabin...looks like the atmospheric and environmental measurements appear to be within limits. On to the crew.

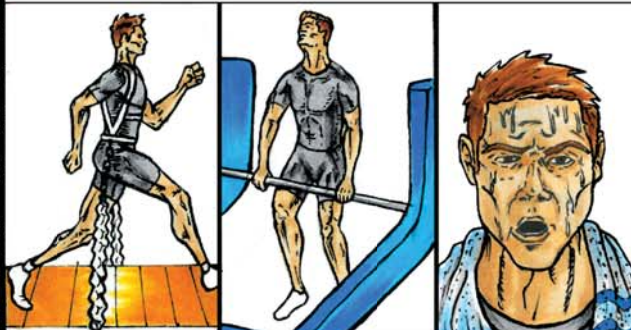
SAM ROGERS///
MALE-42 yrs old
Allergies: N/A (the known drug allergies)
Medications: No chronic medications to date. With medications include Aspirin, Acetaminophen, Diphenhydramine for sleep issues.
Past Medical History: Treatment with asthma, no chronic pre-flight issues besides pre-exercise which has been managed with diet and therapy modifications. No flight history to date includes required urinary voiding. It appears to date which has self-resolved with rest. Early in the mission he had mild Space Adaptation Syndrome and required some doses of Motion and Sickness but that resolved and has not had recurrent issues.

REQUIRED CHECK IN

WEEKLY EXERCISE PERFORMANCE (%)	DAY 62	DAY 63	DAY 64	DAY 65	DAY 66	DAY 67	DAY 68
100	100	100	100	100	100	100	100

Interesting, the medical system is showing a flag on Sam's exercise performance...

The medical system has noted a couple of changes in your exercise capacity and abnormal changes in your vitals.

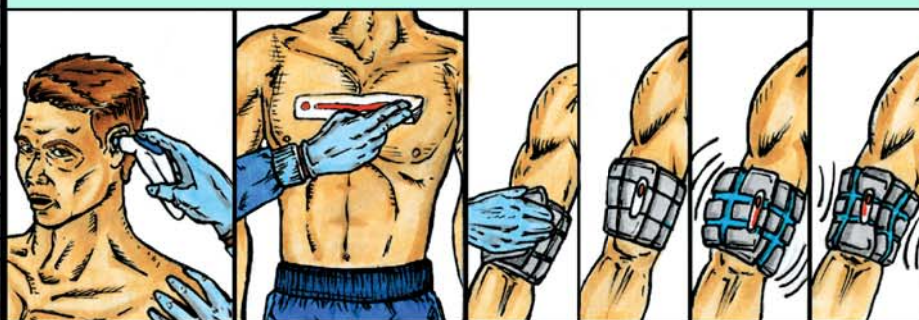


The medical system logged a decrease in your exercise performance over the past 2 days and abnormally high heart rate. You completed the exercises but your resistive exercise force profile and your treadmill time at maximum speed both decreased.



VITALS COLLECTION

MARS MEDICAL SYSTEM



Temperature:
100.2° F

Respiratory Rate:
18 bpm

Heart Rate:
105 bpm

Blood Pressure:
135/74mmHg



I've added my findings to your health record.

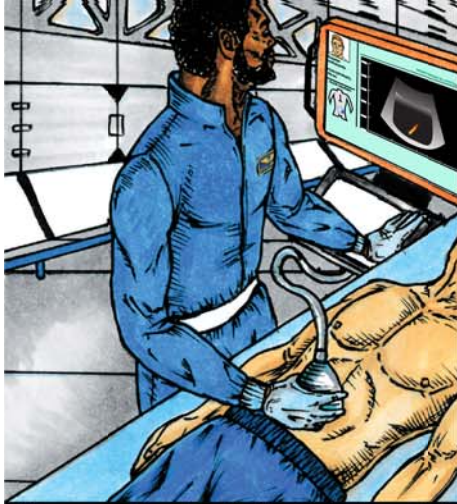
MARS MEDICAL SYSTEM

SAM ROGERS///

SYMPTOMS:
FATIGUE, HEADACHE, INCREASED URGE TO URINATE, FEVER...

DIAGNOSIS (SUGGESTED):
-Urinary tract infection
-Renal stones
-Urinary obstruction
-Pyelonephritis

It seems that based on your exams results and my observations, the system has provided a differential diagnosis. Let's scan your kidneys and bladder to make sure you don't have a stone.



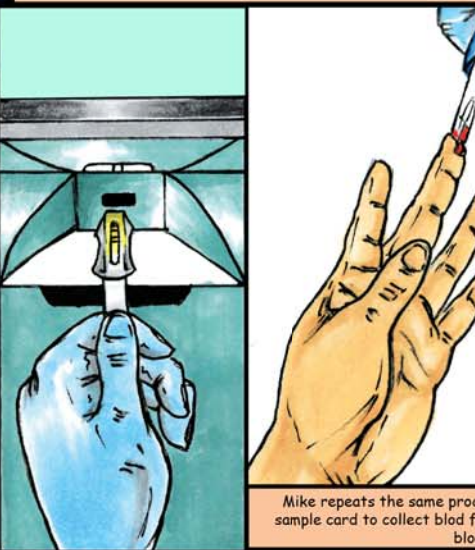
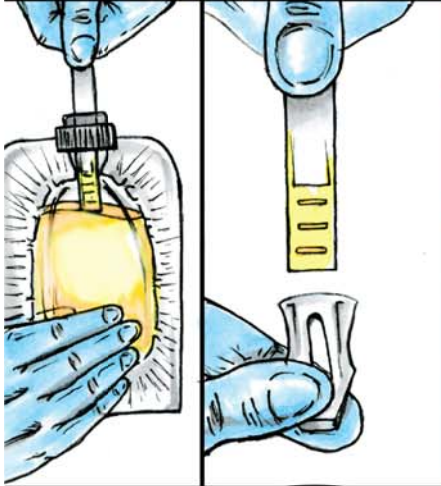
The Medical System shows the image on the monitor and guides the caregiver through the procedure.



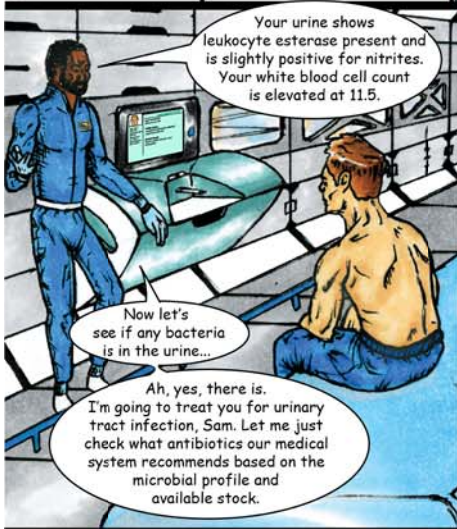
I'm going to need a urine test. Fill this up!

When you get back I'll be ready to take a little blood as well.

Mike uses a sample card to put in the optical analyzer using the Exploration Laboratory Analysis device to analyze the urine sample.



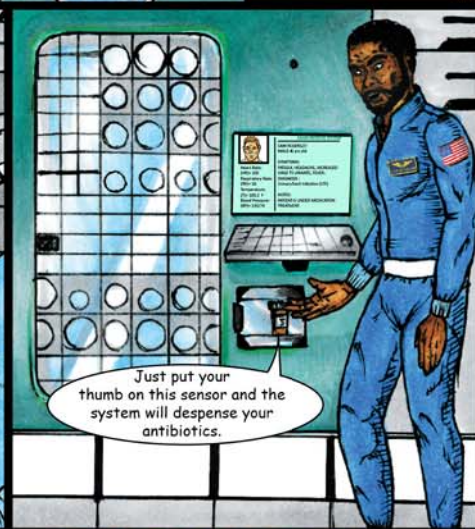
Mike repeats the same process, this time using a fingerstick sample card to collect blood from Sam's finger to do a complete blood count.



Your urine shows leukocyte esterase present and is slightly positive for nitrites. Your white blood cell count is elevated at 11.5.

Now let's see if any bacteria is in the urine...

Ah, yes, there is. I'm going to treat you for urinary tract infection, Sam. Let me just check what antibiotics our medical system recommends based on the microbial profile and available stock.



Just put your thumb on this sensor and the system will dispense your antibiotics.



Now I just need to log the diagnosis and complete my notes in the health record.



The medical system automatically synchronizes the ship's crew health records with the ground version.

Back on Earth, the ground medical team receives the updates of the medical activities and health of the crew on board.



PATIENT NAME: SAM ROBERTS
AGE: 35
SEX: Male
DATE OF BIRTH: 10/15/1980
DIAGNOSIS: Urinary Tract Infection (UTI)
TREATMENT: Antibiotics (Nitrofurantoin)
STATUS: Stable
LAST UPDATE: 10/20/2024